UMR
University of Malaya Research

BULLETIN

QURAN AND HADITH AUTHENTICATION SYSTEM

Clinical and Genetic Predictors for Type 2 Diabetes

LIGHTPHOTON: Q-Switched Micron Fiber Laser

MS ISO/IEC17025:2005 ACCREDITATION

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NO. 2
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ACADEMIC CALENDAR FOR 2017/2018

SEMESTER I				
Introduction Week	1 week	04.09.2017	-	08.09.2017
Lectures	7 weeks*	11.09.2017	-	27.10.2017
Mid-Semester I Break	1 week	28.10.2017	-	05.11.2017
Lectures	7 weeks*	06.11.2017	-	22.12.2017
Revision Week	1 week*	23.12.2017	-	31.12.2017
Examinations Semester I	2 weeks*	01.01.2018	-	14.01.2018
Semester I Break	3 weeks*	15.01.2018	-	04.02.2018
	22 weeks			
SEMESTER II				
Lectures	7 weeks*	05.02.2018	-	23.03.2018
Mid-Semester II Break	1 week	24.03.2018	-	01.04.2018
Lectures	7 weeks*	02.04.2018	-	18.05.2018
Revision Week	1 week	19.05.2018	-	27.05.2018
Examinations Semester II	3 weeks	28.05.2018	-	14.06.2018
	19 weeks			
SESSION BREAK				
Semester Break	12 weeks*	15.06.2018	-	09.09.2018
SPECIAL SEMESTER				
Lectures	7 weeks	25.06.2018	-	12.08.2018
Examinations	1 week	13.08.2018	-	19.08.2018
Semester Break	4 weeks*	20.08.2018		09.09.2018
	12 weeks			

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Centre for Research Services
Level 2, Research Management &
Innovation Complex, University of Malaya

PREFACE

Firstly I would like to congratulate members of the university for their efforts and contribution to the QS University ranking recently. Everyone's contribution is highly appreciated, without which, the university would not have been able to achieve what we have achieved thus far. I would also like to congratulate the Faculty of Engineering and other members who do researches in engineering-related research for being ranked at the10th position in the fourth annual Best Global Universities rankings, which ranked universities around the world based on their academic research performance in specific subjects. The fact a major contribution for the ranking criteria comes from academic research performance shows the strength of our engineering and technical-based research in UM. Such excellence is recognised by our researchers winning some major awards such as the Merdeka Award in the category of Outstanding Scholastic Achievement by Prof. Dr. Masjuki Hassan. Clarivate Analytics' also named two of our researchers, Prof. Masjuki Hassan and Dr. Md Abul Kalam amongst Malaysian highly cited researchers in the area of energy research.

In times of challenging time where funding is concerned, these achievements shows major commitment by our staff and researchers. 2018 will still remain a challenge where research fund is concerned but we will continue to forge forward in trying to get funds for researchers to carry on with their impactful research work. Efforts by our researchers in applying for and getting external funding such as Newton-Ungku Omar, Horizon 2020 and NIH are very much appreciated and I am proud to say that many of our researchers have been successful in getting these grants. To name some of these achievements are Prof. Dr. Phang Siew Moi's Newton Prize Award, Prof . Dr. Edmund Terence Gomez in getting the European Horizon 2020 Grant and NIH grants by threes researchers in the Medical Faculty, Prof. Dr. Yvonne Lim, Prof. Dr. Jamal I-Ching and Prof. Dr. Sazaly Abu Bakar.

UM will continue to support all efforts by our researchers and we hope that 2018 will bring better news and more funds to help our researchers keep the UM's flag and the nation's flag flying. Happy New Year everyone and all the best.

Professor. Dr. Noorsaadah Abd Rahman

Deputy Vice-Chancellor (Research & Innovation)
University of Malaya

This second issue of UM Research Bulletin 2017 features articles on applied research with direct societal impact, from Quran and Hadith Authentication System to Lightphoton for Medical and Industrial Applications, and Portable Scoliosis Diagnosis Device. UM researchers are steadily gaining success in securing international grants. 10 UM researchers were selected for 2 Malaysian cohorts of the Leaders in Innovation Fellowship (LIF) residential programme by the Royal Academy of Engineering in London under the Newton-Ungku Omar Fund. AP Dr Chong Wen Tong, with his Cross-Axis-Wind-Turbine won a place in the pitching competition for the first cohort. 5 UM academics won the Malaysia's Research Star Awards and 5 of our journals received various categories of the Current Research in Malaysia (CREAM) awards. The Ministry of Higher Education introduced the CREAM awards three years ago to recognize quality scholarly journal publications which have showcased noticeable performance and promising growth. As a final note in this preface I would like to acknowledge the MS ISO 17025:2005 accreditation of our laboratories.

Congratulations to all those who have contributed towards research excellence in UM !

Professor. Dr. Shaliza Ibrahim

Associate Vice Chancellor (Research & Innovation)
University of Malaya

EDITORIAL MESSAGE

Happy New Year!

2017 was a challenging and rewarding year for UM research community. For the past one year, our researchers and the research management had demonstrated their dedication, perseverance and innovation in various research related activities. Some of the achievements and success stories are told in the present issue of UMR Bulletin.

In this issue, selected inventions related to light, energy and power, and several inspiring research outputs with great contribution to pharmaceutical and medical industries are featured. Special highlights also given on the award winning residential community project of senior connect group, the Quran and Hadith Authentication System for authenticating Quranic verses online, the mobile app for combating childhood obesity as well as the characterization of Malaysian highly cited papers. Besides a listing of UM e Journals, the present issue shares the experience of 9 research laboratories on their undaunted journey in achieving Malaysian Standard MSISO/IEC 17025:2005 accreditation.

The editorial board would like to thank all the researchers and article contributors and believe that the research momentum in UM will be maintained.

We wish all a productive year in 2018 and happy reading!

Chief editor,

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DESIGN & PRINTING
Centre for Research Services

CONTACT
Centre for Research Services
Institute of Research Management & Services
Level 2, Research Management
& Innovation Complex,
University of Malaya, 50603 Kuala Lumpur

Tel: +603-7967 4651 / 6942
Fax: +603-7967 6390
Email: pengarah_ppp_ippp@um.edu.my
Website: umresearch.um.edu.my

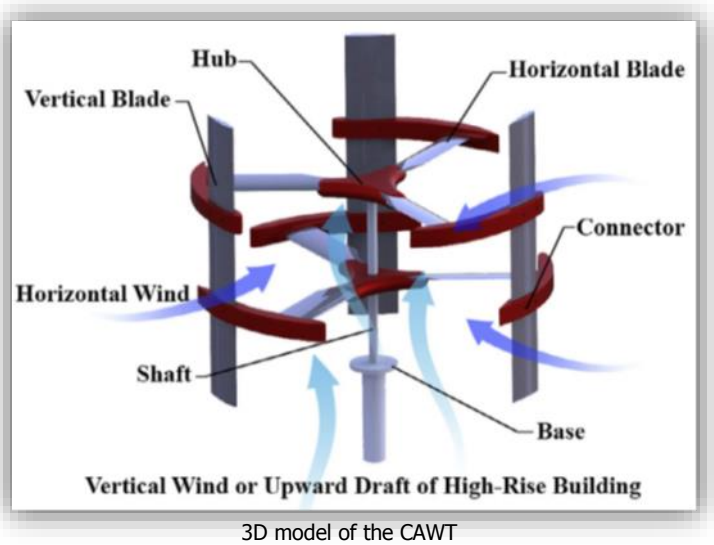
CONTENTS

CROSS-AXIS-WIND-TURBINE: Shaping the Future of Wind Energy Industry

Situations such as low wind speed, high turbulence and frequent wind-direction changes reduce the performance of horizontal axis wind turbines (HAWT). Though certain vertical axis wind turbine (VAWT) designs can operate well under harsh conditions, the VAWT possess low power coefficient. The novel design of Cross-Axis-Wind-Turbine (CAWT) is aimed at building a compact wind turbine system that can operate in an area with complex wind patterns and low wind speed, and also can overcome the disadvantages of both the vertical axis wind turbine (VAWT) and the horizontal axis wind turbine (HAWT).

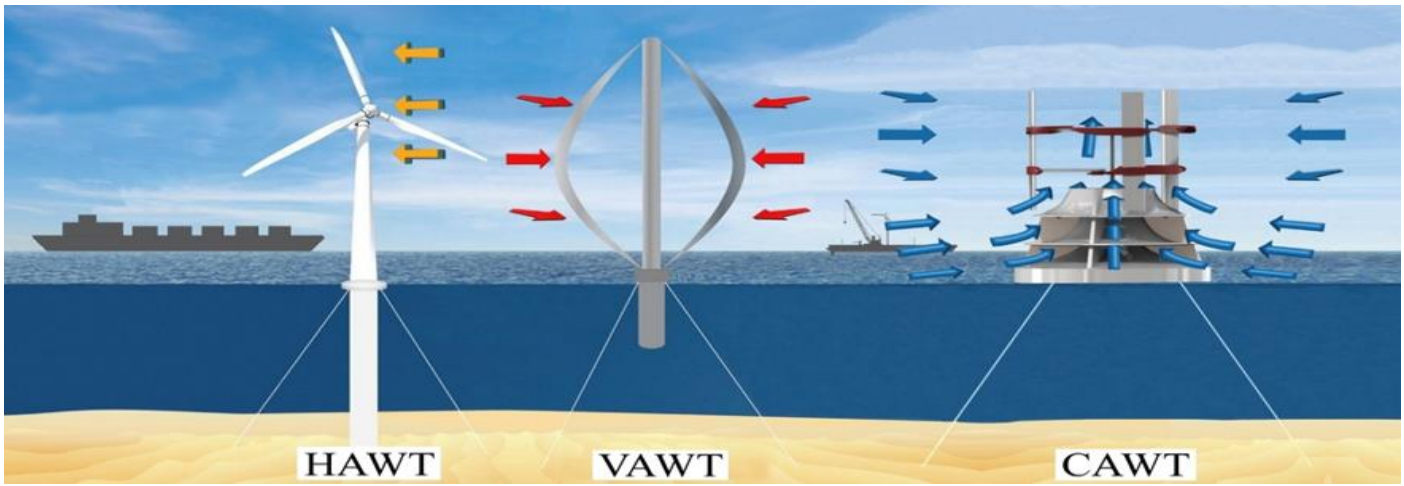
The Cross-Axis-Wind-Turbine (CAWT) rotates on its vertical axis, and comprises of a turbine rotor assembly mounted on the supportive frame. The turbine rotor converts kinetic energy into electrical energy and mechanical energy. An electric generator is also connected to the turbine assembly. The CAWT design has three main vertical blades and six horizontal blades, which are connected via specially designed connectors. This arrangement forms the cross axis wind turbine.

The significant advantage of the CAWT is that it can function with omni-directional air flow from the sides (for the vertical axis wind turbine) and from the bottom (through the horizontal axis blades). The horizontal blades act as the radial arms of the CAWT, connecting the hub to the vertical blades. The vertical wind flow, either created by the building or a guide-vane structure, interacts with the aerofoil-shaped arms. These radial arms act as a horizontal axis wind turbine (HAWT) to create an aero-levitation lift force. The force reduces the bearing friction in the generator, hence extending the lifespan of the wind turbine. Furthermore, the aerofoil-shaped arms enhance self-starting ability of the CAWT, and improve the performance of wind turbine by maximizing utilization of energy from the wind.



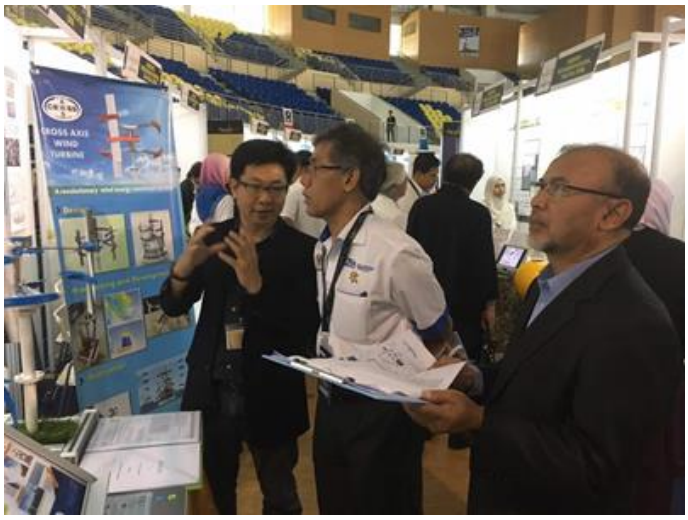
3D model of the CAWT

The CAWT can be used in harvesting off-shore wind power. As compared to the HAWT, it is more stable due to lower center of gravity, giving it an advantage especially during rough sea profiles in bad weather. The CAWT power extraction performance at off-shore is expected to outweigh the VAWT as more torque is available from the concentrated and directed wind produced by the omni-directional. The CAWT system can be installed as a stand-alone, or integrated into buildings for power generation. The installation does not require wire trenching on the ground, and electric power generated can be supplied to the users for any application, such as on-site power generation for urban areas and islands. These applications promise opportunity for a wide market for remote islands in countries such as Philippines and Indonesia. This research invention is also suitable to be installed for both urban areas and locations that are distant from the national grid line such as fish farms, highlands and beach resorts.



A comparison of offshore application for different wind turbines: the HAWT, VAWT, and the proposed CAWT

Assoc. Prof. Dr. Chong Wen Tong and his research group from the Faculty of Engineering was awarded Gold Award for the Environment & Renewable Energy category for this invention in the recent 2017 PECIPTA. The award was presented by YB Dato' Seri Idris Bin Jusoh, Minister of Higher Education as well as YBhg. Datin Paduka Ir. Dr. Siti Hamisah Tapsir, the Director General of Higher Education. This invention also won First Prize for patent category in the National Intellectual Property Award (Anugerah Harta Intelek Negara (AHIN)) by Ministry of Domestic Trade, Co-operatives and Consumerism and Intellectual Property Corporation of Malaysia (MyIPO) in 2016. In addition, the CAWT had previously won 1st runner up in the Engineering Invention & Innovation Exhibition (EINIX 2015) organized by The Institution of Engineers Malaysia (IEM).



Dr. Chong explaining the concept of the CAWT to the judging panel

Currently, the research group has developed an up-scale 300W prototype ready for field testing. The project is supported by the Fundamental Research Grant Scheme (FP053-2013B), Malaysian Ministry of Higher Education and University of Malaya High Impact Research Grant (HIRG). The research group would like to thank UM Centre of Innovation & Commercialization (UMCIC) for patent filing and support throughout the research and development.

Further information about the CAWT can be obtained from W.T. Chong, W. K. Muzammil, K.H. Wong, C.T. Wang, M. Gwani, Y.J. Chu, S.C. Poh. Cross axis wind turbine: Pushing the limit of wind turbine technology with complementary design. *Applied Energy*. Available online 6 July 2017, ISSN 0306-2619,

WIND A CROSS S TURBINE

CROSS AXIS WIND TURBINE

CAWT trademark

PI 2015702341
TM: 2015061536

The 300 W CAWT prototype

ASSOC. PROF. DR. CHONG WEN TONG

Department of Mechanical Engineering
Faculty of Engineering
University of Malaya

chong_wentong@um.edu.my

LIGHTPHOTON: Q-switched 2 Micron Fiber Laser Module for Industrial and Medical Applications

The advancement of photonics technology has moved short pulse lasers beyond laboratory experiments into real applications in industry and medicine. This success was due to the ability of pulse lasers to concentrate light energy into bursts of beam in duration of microseconds to picoseconds, and focus the coherent light onto a precise tiny space. This pulse train provides high intensity light needed to ablate material from the surface quickly and cleanly without damaging the underlying areas.

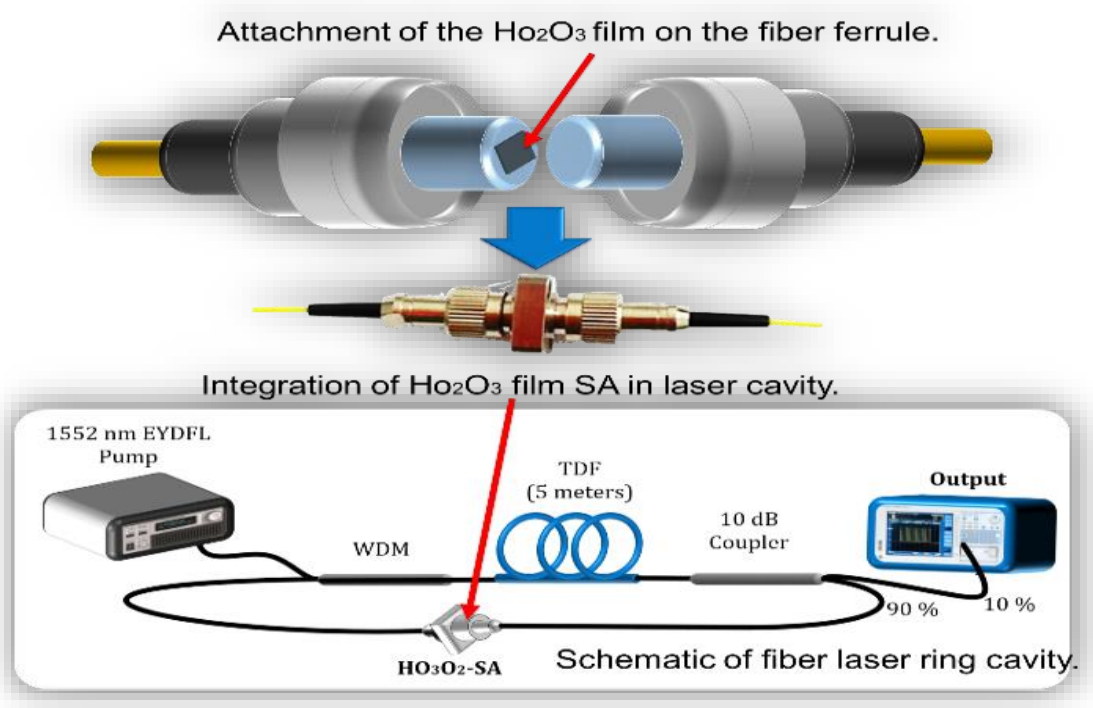
In plastic material processing, conventional laser uses additive chemicals to increase light absorption for cutting and marking. As a result, the process becomes more expensive. A group of engineers from Photonics Engineering Laboratory, has invented **LIGHTPHOTON,** an innovative form of new fiber laser, to solve this issue. The laser delivers pure short pulsed laser which can be easily operated by personal or handheld computers. Plastics can now be cut and marked without additive chemicals.

LIGHTPHOTON

The **LIGHTPHOTON** laser operates in "eye-safe" wavelength of 2 μm region. The laser is highly absorbed by water substance and only penetrates a minimum depth of human tissues. During a medical surgery, **LIGHTPHOTON** can be used to reduce the damage around exposed area caused by tissue ablation. As the laser only cuts or removes tissues, it can immediately seal blood vessels and nerve endings, thus reduces bleeding and pain. High peak power generated by LIGHTPHOTON can eliminate surface bacteria as well.

As compared to commercial lasers such as gas or dye laser, **LIGHTPHOTON** has been developed using an all-fiber laser technology. The fiber laser is more robust, compact in size and alignment-free. It incurs near zero maintenance and thus is cost-effective. The passive saturable absorber used in the fiber laser is fabricated from nanomaterial elements and is the key component to self-pulsing. This saturable absorber is inserted between two fiber connectors in the ring cavity. Thulium-doped fiber, a gain medium, is responsible for laser operation at 2-micron region.

LIGHTPHOTON generates Q-switched pulsed laser with a repetition rate in kilohertz, a pulse duration in microseconds, and high peak power.



Pulsed fiber laser configuration in ring cavity. Inset image shows the position of saturable absorber.

Team members at the PECIPTA 2017

This research output was published in Chinese Physics Letters (doi.org/10.1088/0256307X/34/5/054201).

To date, **LIGHTPHOTON** has won a Gold medal in PECIPTA 2017. The researchers are expanding their laser module as neutralizer for land and air threats, a joint-collaboration with AVP Engineering (M) Sdn. Bhd.

PROF. DR. SULAIMAN WADI HARUN

Department of Electrical Engineering
Faculty of Engineering
University of Malaya

swharun@um.edu.my

Clinical and Genetic Predictors for Malaysian Type 2 Diabetes Patients

Type 2 diabetes is one of the major non-communicable diseases which continues to increase. According to the International Diabetes Federation (IDF), the global prevalence of Type 2 diabetes was 425 million in 2017. The 2015 National Health and Morbidity Survey (NHMS) by Ministry of Health Malaysia reported that 17.5% of the adults have Type 2 diabetes. The progressive nature of Type 2 diabetes gives rise to various complications, including stroke, heart attack, kidney failure, blindness and leg amputations. Hence, a good control of blood glucose levels for Type 2 diabetes patients, which is achievable via diet control, exercise and medications, is of utmost important.

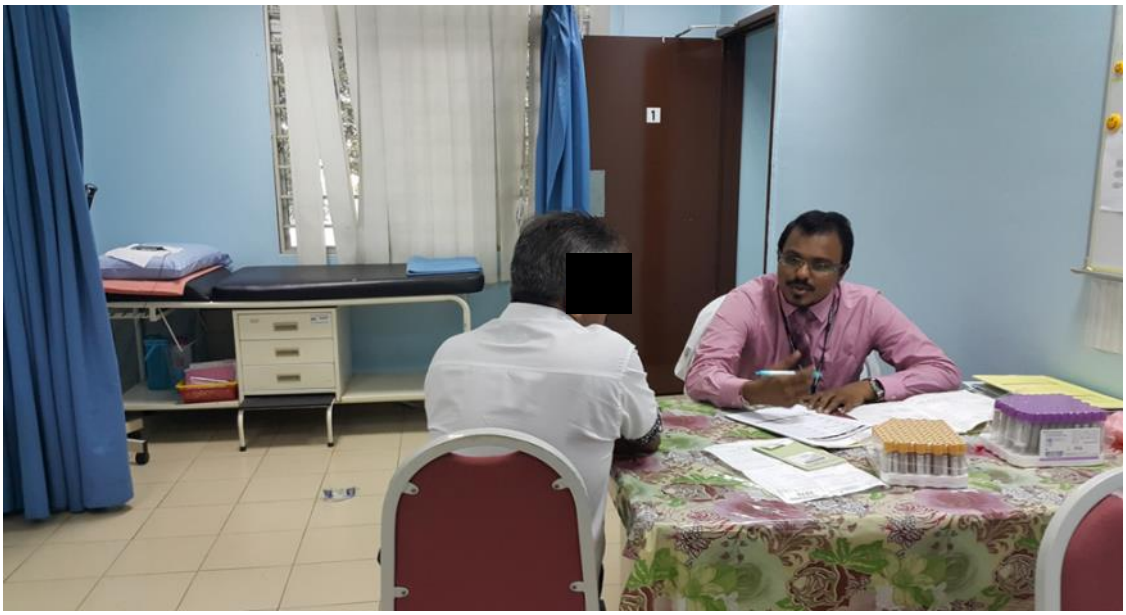
One of the most commonly used medications for Type 2 diabetes is sulphonylurea, including drugs like glibenclamide, gliclazide and glimepiride. This medication stimulates the release of insulin from pancreas, a deficiency in Type 2 diabetes patients, thus helping to lower glucose levels. The response to sulphonylurea can vary depending on factors such as years of having diabetes, status of diabetes control at the start of sulphonylurea therapy, kidney function and the presence of certain genetic mutations. Earlier studies showed that these factors significantly associate with the risk of Type 2 diabetes patients failing sulphonylurea therapy or having hypoglycemia as side effect.

The current project aims to investigate the clinical and genetic factors to predict the incidence of sulphoylurea failure and sulphonylurea-induced hypoglycemia in Malaysian Type 2 diabetes patients. The study is a prospective multi-centre design across various geographical locations in Malaysia, including Hospital Pulau Pinang, Hospital Kuala Lumpur, University of Malaya Medical Centre (UMMC), Klinik Kesihatan Jalan Mahmoodiah Johor Bahru, Hospital Sultanah Nur Zahirah Kuala Terengganu, Klinik Kesihatan Jalan Masjid, Kuching and Klinik Kesihatan Luyang, Kota Kinabalu.

The researchers started recruiting eligible study patients from October 2014. Patients' information was collected through their medical records as well as interviews. Their blood samples were also taken and sent back to the university for DNA extraction, insulin and c-peptide tests. DNA samples were then used to identify mutations for several Type 2 Diabetes genes, including ABCC8, KCNJ11 and TCF7L2 using the highly specific Real-Time Polymerase Chain Reaction (RT-PCR) method.

The staff nurse at Klinik Kesihatan Jalan Masjid, Kuching measuring the waist circumference for a study patient

A total of 415 patients were recruited at baseline. These patients were followed-up for 12-months and monitored for hypoglycemia episodes. At the end of the 12-months period, patients were classified as (i) either having failed sulphonylurea therapy or not; (ii) either having hypoglycemia or not. The preliminary findings of this study showed that subjects' pancreas function was significantly associated with diabetes control. The lower the pancreas function or insulin secreting capacity, the poorer the subjects' HbA1c levels and the higher the likelihood of failing sulphonylurea therapy. In addition, the higher the insulin resistance (making glucose difficult to be transported into the cells), the higher the risk of failing sulphonylurea therapy. The findings also showed that having a poorer kidney function was associated with a higher chance of good glucose level, hence lower risk of failing sulphonylurea therapy. Those who have higher glucose levels at the start of the study were mostly failed in the sulphonylurea therapy. Among the gene mutations investigated, patients who carry the CDKAL1 gene mutation are more likely to have secondary sulphonylurea failure. It was also shown that Type 2 diabetes subjects with longer duration of both diabetes history and sulphonylurea use are more likely to experience sulphonylurea-induced hypoglycemia. Furthermore, those with better glucose control (lower HbA1c levels) at the beginning of the study have higher rates of hypoglycemia.



The experience of carrying out this study at multiple locations in Malaysia was invaluable. Researchers were able to study patients from different ethnicities, geographical and cultural background. The cooperation given by the patients and staffs (doctors and nurses) at the study sites ensured the success of this study.

Mr. Navin Kumar Loganadan in the midst of interview and data collection.

Blood samples from Hospital Pulau Pinang to be transported back to University of Malaya for DNA, insulin and c-peptide tests

Mr. Navin Kumar Loganadan carried out DNA extraction at the Medical Biotechnology Laboratory, Faculty of Medicine (observed by Assoc. Prof. Dr. Hasniza Zaman Huri and other research assistants)

The findings from this study may be useful in our local Type 2 diabetes management. By identifying the factors that contribute to the patients failing sulphonylurea therapy, cautions can be taken to assure that patients benefitted much earlier from other antidiabetic agents instead of sulphonylurea during their treatment. Similarly, knowing the characteristics of high risk sulphonylurea-induced hypoglycemia patients will allow clinicians to use a lower dosage of sulphonylurea and minimizes its risk.

ASSOC. PROF. DR. HASNIZA ZAMAN HURI

Department of Pharmacy
Faculty of Medicine
University of Malaya

hasnizah@um.edu.my

Quran and Hadith Authentication System

Trends of internet usage and accessing online contents are proliferating at a considerable speed. There is a vast amount of digital online content available in different languages, such as Chinese, Persian and Arabic, which is sensitive in nature with respect to writing styles and arrangement of diacritics (special symbols that assist in reading words correctly). However, research on techniques for verification of the originality of sensitive digital online content is limited. It is a challenge to explore and develop methods to authenticate the originality of a given online content. Hence, preserving and verifying sensitive content constitutes an emerging problem and calls for timely solutions.

According to World Internet Statistic report 2016, the Arabic content is on rise currently and is available in different formats on internet. The digital Holy Qur'an in Arabic constitutes one case of such sensitive content. Due to the different characteristics of the Arabic letters like diacritics (punctuation symbols), kashidas (extended letters) and other symbols, it is very easy to alter the original meaning of the text by simply changing the arrangement of diacritics.

In both verses, only one symbol was changed. A mere one symbol changes the meaning of the complete sentence. It is very difficult for a non-native Arabic speaker to observe and differentiate these tampered verses from the correct one. Preserving content integrity of digital scriptures like Quran helps people to read and understand the true meaning of texts without worrying about the tampered content.

Dr. Amiruddin and his team at PECIPTA2017

إِنَّمَا يَخْشَى اللَّـهَ مِنْ عِبَاد

(It is only those who have knowledge among His slaves that fear Allah – Chapter 35 –verse 28)

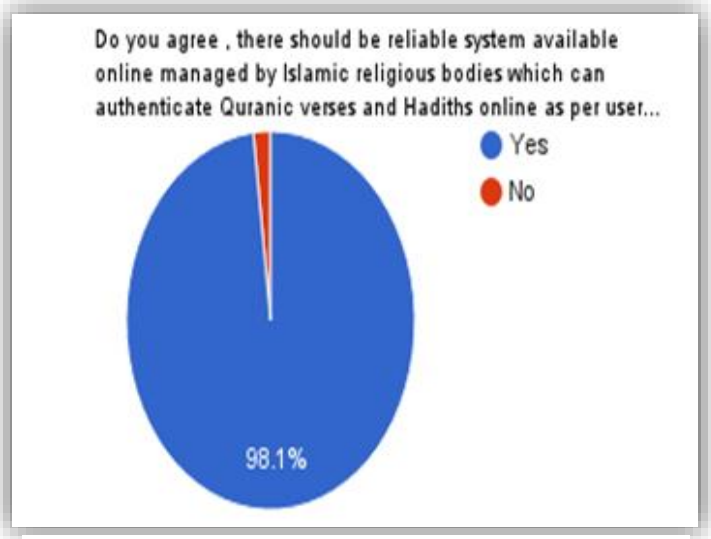
and

إِنَّمَا يَخْشَى اللَّـهُ مِنْ عِبَادِهِ الْعُلَمَاءُ

(It is Allah who fears His slaves

ِهِ الْعُلَمَاءُ

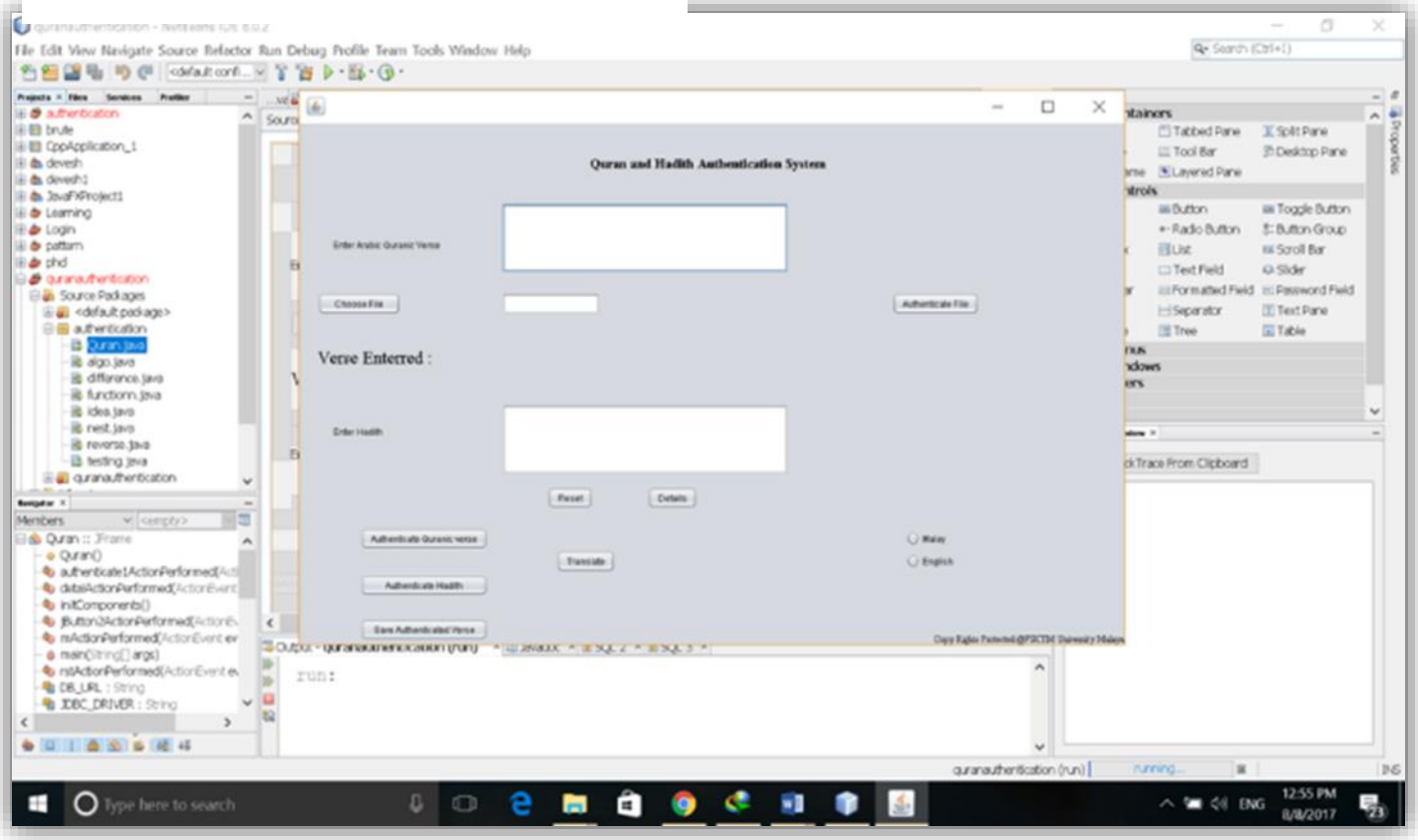
Fake or tampered Quranic verses are being (forwarded and spread among the public through websites and social media) platforms. As such, the researchers would like to develop a system that can authenticate any Quranic verses or Hadith on the internet. This innovation will automatically check the authenticity of Quranic verse and correct it. The researchers are focusing on Uthmani version of Quran and plan to explore other styles of Quran like Varsh and non-Uthmani.



Result of survey

A survey related to authenticity of Quran was carried out in University of Malaya and IIUM Malaysia. It was found that a majority of the respondents are not aware whether they are reading the Quranic verses in its original form or not.

The developed system is fully automatic and can detect any tampered verse. User is required to key-in the Quranic verse that need to be checked, and the system automatically corrects the tampered verse and highlights the fake portion in red. Hence, this innovation will be able to preserve the content integrity of digital Quran and check for tampered Quranic verses online.



Quran and Hadith Authentication Prototype

The research was a collaboration with Noor Research Center, Taibah University, Saudi Arabia. Its findings were published in conference papers and ISI journal articles. Patent has also been filed. The invention won a special award and a gold medal at the 2017 PECIPTA. Besides that, the researchers were also awarded Gold medal at IIDEX 2017. The product can be used by those interested in reading authentic version of online Quran. The researchers plan to include hadith authentication in future and develop the first full-fledged authentication system that can authenticate Quran as well as hadith available online.

DR. AMIRRUDIN BIN KAMSIN

Department of Computer System & Technology
Faculty of Computer Science & Information Technology
University of Malaya

amir@um.edu.my

Award Winning Residential Community Project

The Senior Connect Group (SCG) from SS 20 community walked away RM 20,000 on 15th December, 2017, winning the 2nd runner up place for the MBPJ's Sustainable Community Awards. SCG is a residential mutual support group which was established through partnerships between the senior residents and University of Malaya's PISA (Promote Independent among Senior with Osteoarthritis) research team.

Senior Connect Group won 2nd Runner Up, Sustainable Community Awards 2017 by MBPJ

The project started after the Malaysian Elders Longitudinal Research (MELoR) study in March, 2016 with the objective to promote social participation among the seniors in their community. This study was funded by UM Grand Challenge - Wellness Research Cluster (GC002C-14HTM) entitled "Social Participation and the Effects of Social Intervention in Older Persons with Osteoarthritis (SPESI-OA). Special thanks to the Dean of Wellness Research Cluster, Professor Dr. Noor Hayaty Abu Kasim; the Project leader, Professor Tan Maw Pin; the Primary Investigator of the sub-study, Dr. Chong Mei Chan and our external collaborator from UTM, Dr. Tan Joo Siang, for their tremendous contributions and support to move this project.

The SCG leaders and members were on the stage for MBPJ's Sustainable Community Awards ceremony on 15th December, 2017

Senior Connect Group was formed by the senior residents and for the senior residents. Its sustainability harnessed the expertise and commitment of the leaders, reciprocal generous contributions and support from the senior residents. SCG has provided support in the community through medical education (preventive programs), medic alert and rehabilitative support. Social participation among the seniors also increased through the synergy effects after the voluntary training of Empathetic Listening Skill. The senior residents have developed more social activities, including:

- Jungle trekking
- Park dancing
- Tea and Talk gathering for sharing experience healthcare services and resources
- Senior Induction Course to draw out the less active community members as an attempt to reduce isolation
- Brisk walking
- Other social activities (such as sharing their gardening skills, cooking and open house for festive celebration)

Leaders of SCG took charge of the award application process. One leader of the SCG shared "Thank you UM PISA research team for planting the seed in our community. We would not have come thus far without the initiation." Their success implicates the significance of empowerment from a credential institution towards the community, high education, and genuine civic mindedness for common good of the community.

DR. TEOH GAIK KIN

Department of Nursing Science
Faculty of Medicine
University of Malaya

teohgaikkin@um.edu.my
teohgaikkin@yahoo.com

Innovative Powder-based Magnetron sputtering Physical Vapor Deposition (PPVD) System

Imagine a sub-micron thickness thin layer on work piece with superior properties. A group of UM researchers developed a high technology system that sputters loosely compacted powders for depositing this thin layer. This invention opens up endless possibility of using a variation of materials for applications in the industry.

Physical Vapor Deposition (PVD) technologies address industrial issues related to community to find new ideas for improved properties of thin film and its application, as well as to reduce its cost.

High performance materials with combined properties have higher demand for robust environment and complex system. When the bulk materials performance is limited, the surface of the bulk directly interacted with the applied environment will be strengthened by thin film deposition. The thin film technology by PVD is still being developed and is the key in twenty-first century development of new materials. PVD is a vacuum coating process, wherein various materials are coated on substrates to form a thin protective film. This coating exhibits higher strength and durability, and corrosion-resistant properties as compared to the conventional coating process. The PVD market, which accounts for over 20 billion USD, is employed in industries such as microelectronics, data storage devices, medical equipment, solar panels, and construction industry.

ASSOC. PROF. IR .DR. BUSHROA ABDUL RAZAK

Department of Mechanical Engineering
Faculty of Engineering
University of Malaya

bushroa@um.edu.my

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- Journal of Shariah Law Research - ejournal.um.edu.my/index.php/JSLR
- Journal of Special Needs Education - ejournal.um.edu.my/index.php/JSNE
- Jurnal Kepimpinan Pendidikan - jupidi.um.edu.my
- Jurnal Kurikulum & Pengajaran Asia Pasifik - juku.um.edu.my
- Kekal Abadi - ejournal.um.edu.my/index.php/KA
- Malaysian Journal of Library & Information Science - mjlis.um.edu.my
- Malaysian Journal of Economic Studies - mjes.um.edu.my
- Malaysian Journal of International Relations - mjir.um.edu.my
- Malaysian Journal of Media Studies - jpmm.um.edu.my
- Malaysian Online Journal of Counseling - mojc.um.edu.my
- Malaysian Online Journal of Educational Management - mojem.um.edu.my
- Online Journal of Islamic Education - ojie.um.edu.my

Journal Listing

SOCIAL SCIENCES

- Online Journal of Research in Islamic Studies - ejournal.um.edu.my/index.php/RIS
- Pemimpin (The Leader) - ejournal.um.edu.my/index.php/PEMIMPIN
- The Malaysian Journal of Social Administration - ejournal.um.edu.my/index.php/MJSA
- SARJANA - ejournal.um.edu.my/index.php/SARJANA

ARTS & HUMANITIES

- AFKAR : Jurnal Akidah & Pemikiran Islam / Journal of Aqidah & Islamic Thought - ejournal.um.edu.my/index.php/afkar
- Asia Pacific Online Journal of Arabic Studies - ejournal.um.edu.my/index.php/APOJAS
- Journal Al-Tamaddun - ejournal.um.edu.my/index.php/JAT
- Journal of Modern Languages - ejournal.um.edu.my/index.php/JML
- Jurnal Bahasa dan Budaya Jepun - ejournal.um.edu.my/index.php/JBBJ

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- Jurnal Fiqh - ejournal.um.edu.my/index.php/fiqh
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- KATHA - ejournal.um.edu.my/index.php/KATHA
- Malaysian Journal of Performing and Visual Arts - ejournal.um.edu.my/index.php/MJPVA
- QURANICA - International Journal of Quranic Research - ejournal.um.edu.my/index.php/quranica
- SARE : Southeast Asian Review of English - ejournal.um.edu.my/index.php/SARE
- SEJARAH : Journal of the Department of History - ejournal.um.edu.my/index.php/SEJARAH

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- Journal of Design and Built Environment - ejournal.um.edu.my/index.php/jdbe
- Journal of Health and Translational Medicine - ejournal.um.edu.my/index.php/jummec
- Journal of Integrative Computational Biosciences - ejournal.um.edu.my/index.php/JICB
- Journal of Surveying, Construction & Property - ejournal.um.edu.my/index.php/JSCP
- Malaysian Journal of Computer Science - ejournal.um.edu.my/index.php/MJCS
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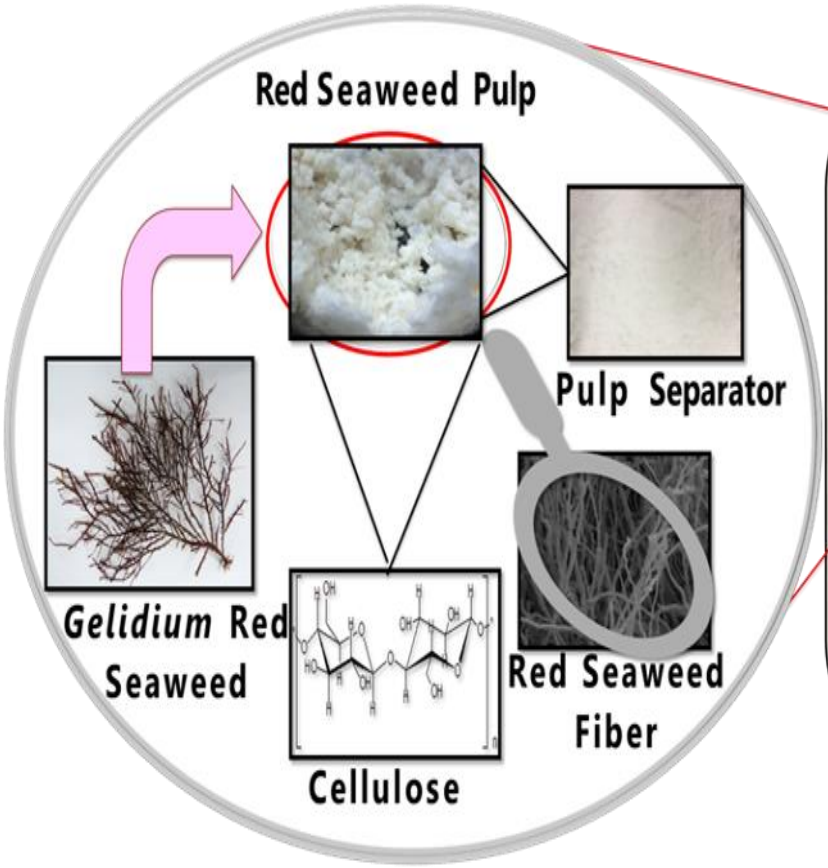
CONTACT INFORMATION:

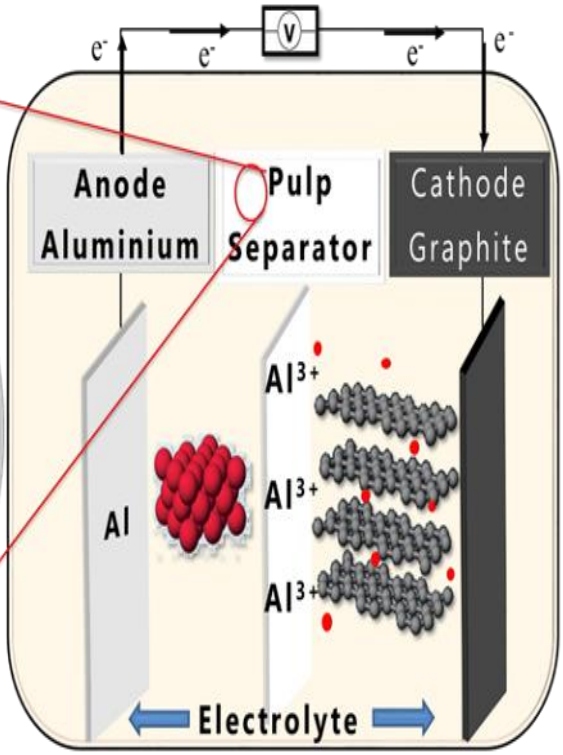
Research Support Unit,
Center for Research Services,
Institute of Research Management & Monitoring (IPPP)
University of Malaya, 50603
Kuala Lumpur, Malaysia
Tel: +603 79677812
Fax: +603 79677354
email: uspi@um.edu.my

Eco-friendly Separator for Aluminium Battery

Seaweed industry has been identified as one of the key area under the Malaysian National Key Economic Areas (NKEA). Meanwhile, global seaweed trade and industry has reached USD 6.4 billion with the production of 23.4 million metric ton (MT) seaweeds. Among all seaweeds, the red seaweeds are: (1) renewable and sustainable feed-stocks, (2) have no conflict with food crops on arable land, (3) require minimum chemical and energy during pulp processing and, (4) reduce CO^2 through photosynthesis process. As such, the researchers introduced this new economical red seaweed seed (*Gelidium*) to the local farmers and cultivators. In addition, new technology has been proposed through collaboration with Fisheries Department and cooperatives to create another economic opportunity in developing a sustainable technology for cultivating seaweed offshore and onshore. The researchers also conducted an extensive literature review on the social, economic and cultural benefits and the issues in seaweed cultivation for the coastal areas communities in Malaysia.



Schematic illustration of red seaweed pulp separator

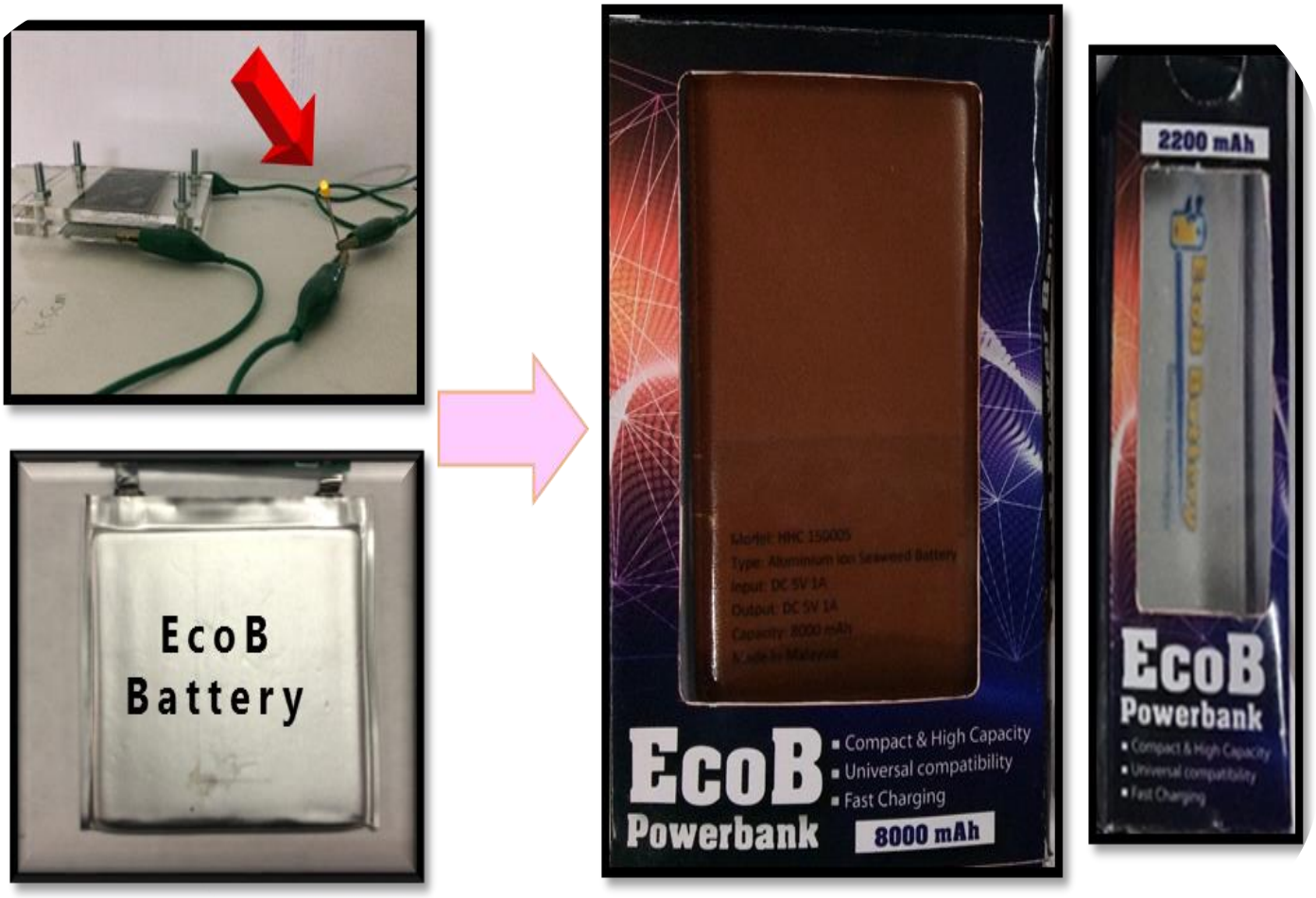


Schematic illustration of aluminium-graphite battery

Gelidium consists of agar and pulp which can be converted to high value-added products, thus creating market value for the seaweed. The pulp contains small, regular and hollow fiber internally. This characteristic makes the pulp exhibit large surface area with high absorptivity, which is desirable in turning it into a separator to replace the conventional polymer separator.

The separator is the most critical threat for safety in a battery system. It prevents electric contact of the positive and negative electrode while maintaining the free flow of ions via liquid electrolyte-filled pores in the structure. The world market for separators is expected to exceed $3 billion by 2020 due to the increasing high performance of separator to meet all requirement for new battery application. Therefore, the usage of red seaweed pulp as a tantalizing material for developing battery separator is promising. This will further push Malaysia to move into a new economic border and expand the market opportunities of battery separator production.

The research team has successfully developed a rechargeable bio-battery, which comprised of pulp separator embedded with salt/Al ion conducting imidazolium-type ionic liquid electrolyte, sandwiched between aluminum plate (anode) and modified graphite plate (cathode). This novel battery is slim, light weight, high electrochemical potential of 2.2V, discharge capacity of 50 mAh, and the charge-discharge can withstand up to 10 cycles. It also has a fast charging capability to energize many appliances such as phone, light-emitting diode (LED), car toy, fan, etc.



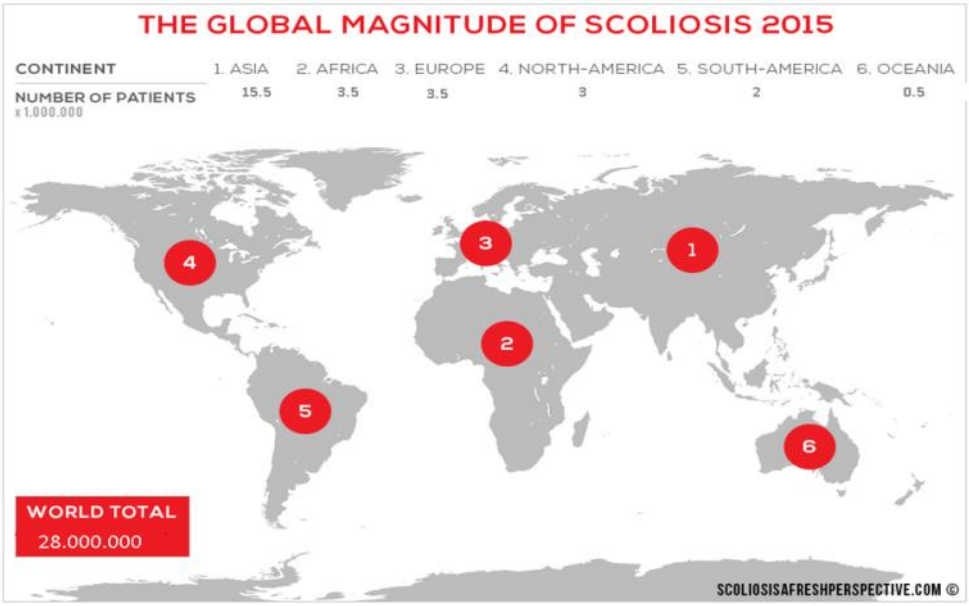
Development of red seaweed pulp-based battery prototype to EcoB Powerbank

Assoc. Prof. Dr. Juan Joon Ching

Nanotechnology and Catalysis Research Centre (NANOCAT)
University of Malaya

jcjuan@um.edu.my

ScolioS^2 – Portable Device for Diagnosis of Scoliosis and Shoulder Symmetricity Assessment



DO YOU KNOW?

- 28 million was diagnosed of Scoliosis in 2015
- 32 million is expected in 2033.
- 91,031 Malaysians were diagnosed with scoliosis in 2016.

Scoliosis is a medical condition caused by lateral curvature of the spine that affects individuals of all ages. It is one of the global health problems which causes daily discomforts. Most scoliosis cases are idiopathic whereby their causes are unknown. In fact, many are unaware of having this condition due to lack of public awareness towards the pervasiveness of spinal deformities. Besides that, underdeveloped areas may not have the healthcare services and clinical equipment for diagnosis of scoliosis.

The current techniques and tools for scoliosis diagnosis such as X-ray screening and conventional scoliometer have many limitations, resulting in unreliable and ineffective scoliosis detection. Furthermore, physicians have no effective guide on scoliosis corrective surgery to compare with for the patients' pre- and post- operative shoulder balance. Doctors are relying on inaccurate, inefficient, invasive, time-consuming and costly tools to check for shoulder symmetricity in scoliosis patients. Hence, there is a strong demand for point-of-care (POC) device which will provide accurate and convenient diagnosis for scoliosis as well as shoulder height difference (SHD) measurement.

The ScolioS^2 is equipped with features to measure the shoulder height difference (SHD) and to detect shoulder imbalance in scoliosis patients. The digital readings provide highly accurate and precise measurements as compared to the analogue version in conventional scoliometer as well as the Baseline® scoliometer. Furthermore, the analogue readings are subjected to parallax error and may cause unreliable results. ScolioS^2 uses non-invasive approach to measure shoulder height difference (SHD), shoulder lateral tilting angle (SLTA) and angle of trunk rotation (ATR), thus not causing any side effects on the patients. In addition, the ScolioS^2 is relatively low cost, and its outer body part is made of thermoplastic polymer material using 3D printing technology. This safety feature protects the users from electrical hazard should there be accidental leakages. The most distinctive feature of ScolioS^2 is it meets the standard point of care (POC) for doctors to perform the measurements anywhere, especially for mobile clinics and rural areas without healthcare facilities.

The prototype of ScolioS^2 was designed using Solidworks and printed using the 3D Stratasys Mojo printer. The electronic basically consists of sensors (rotary encoder and accelerometer), processor (Arduino Nano) and actuators (LCD display and LED bulb). ScolioS^2 will measure the ATR of a patient when the "push button" is pressed. Contrarily, when the "push button" is released, the ScolioS^2 measures the shoulder height difference and shoulder lateral tilting angle of scoliosis patient.

The ScolioS^2 is operator-friendly and can be configured into two different modes with just a click – (i) SHD measurement for pre- and post- operative shoulder balance assessment and (ii) ATR for preliminary diagnosis of scoliosis device. The extension racks can be adjusted for different shoulder width with the implementation of a simple racks and pinion mechanism. This invention significantly reduces time needed for taking the SHD, SLTA and ATR measurements, hence enabling doctors to deliver efficient point-of-care services for scoliosis patients.

How to Measure SHD, SLTA, ATR?

To measure SHD and SLTA, a patient is required to stand up straight and the distal ends of both racks will be placed on the patient's acromions, the outward end of the spine of shoulder blade or scapula. When the rack is moved, the gear will be rotated due to translational motion. This rotational displacement will be converted into linear displacement used to compute the shoulder width. The built-in accelerometer later calculates the lateral inclination of the device (which is equivalent to the SLTA). Using trigonometric relationship, shoulder width and SLTA, the shoulder height difference of the patient can be calculated.

To measure ATR of a patient, the "push button" (labelled with 'M') has to be pressed. The patient is required to remove or wear minimum clothes and perform the Adam's forward test for the spine to be visible. The center bottom of the ScolioS2 is then placed over the patient's spinal process and moved along the patient's spine from the cervical to the lumbar region for any spinal deformity checking. ATR is the maximum lateral tilting angle measured when the device is moved along patient's back. Studies found that patients with ATR of 7º or more are mostly likely to have scoliosis.

This project is headed by Ir. Dr. Lai Khin Wee from Dept. of Biomedical Engineering, Faculty of Engineering, together with Dr. Chiu Chee Kidd from Faculty of Medicine and also Low June Weng; the phD student from Faculty of Engineering.

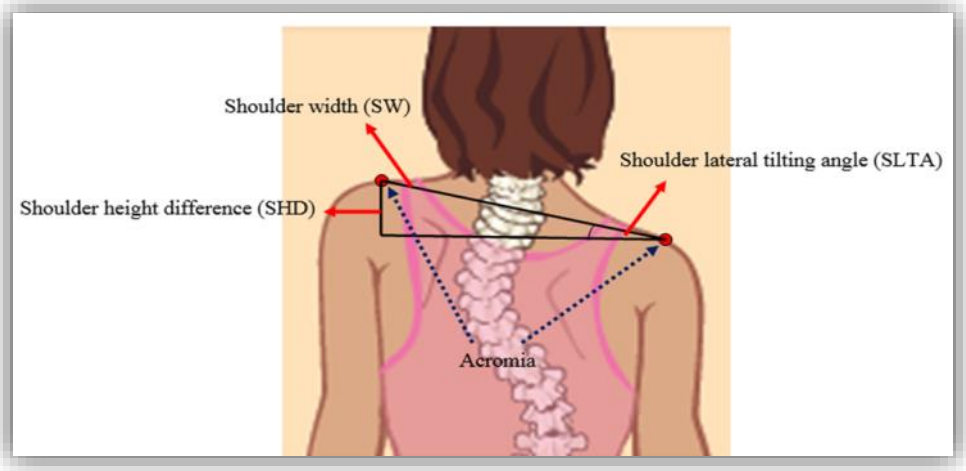
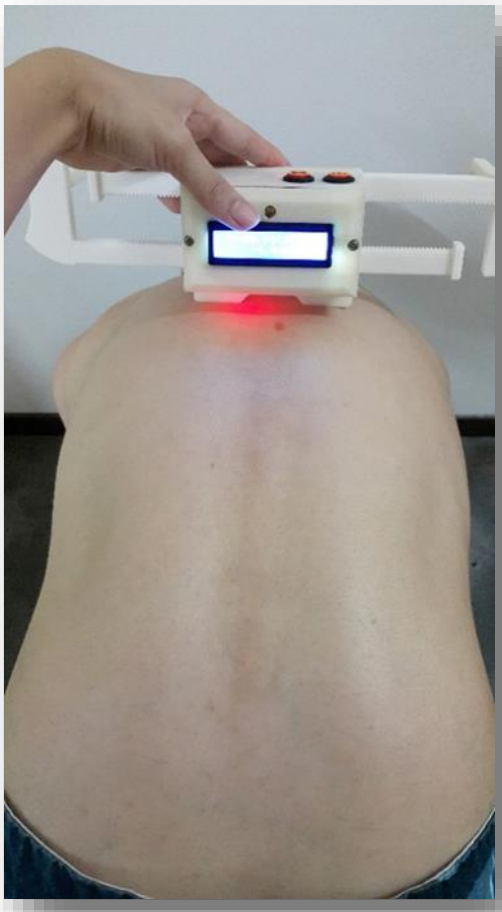


Illustration of the trigonometric relationships between SW, SLTA and SHD

Measurement of SHD and SLTA of subject



Measurement of ATR of subjects

SHD– Shoulder height difference

SLTA– Shoulder lateral titling angle

ATR– Angle of trunk rotation

IR. DR. LAI KHIN WEE

Department of Biomedical Engineering
Faculty of Engineering
University of Malaya

lai.khinwee@um.edu.my

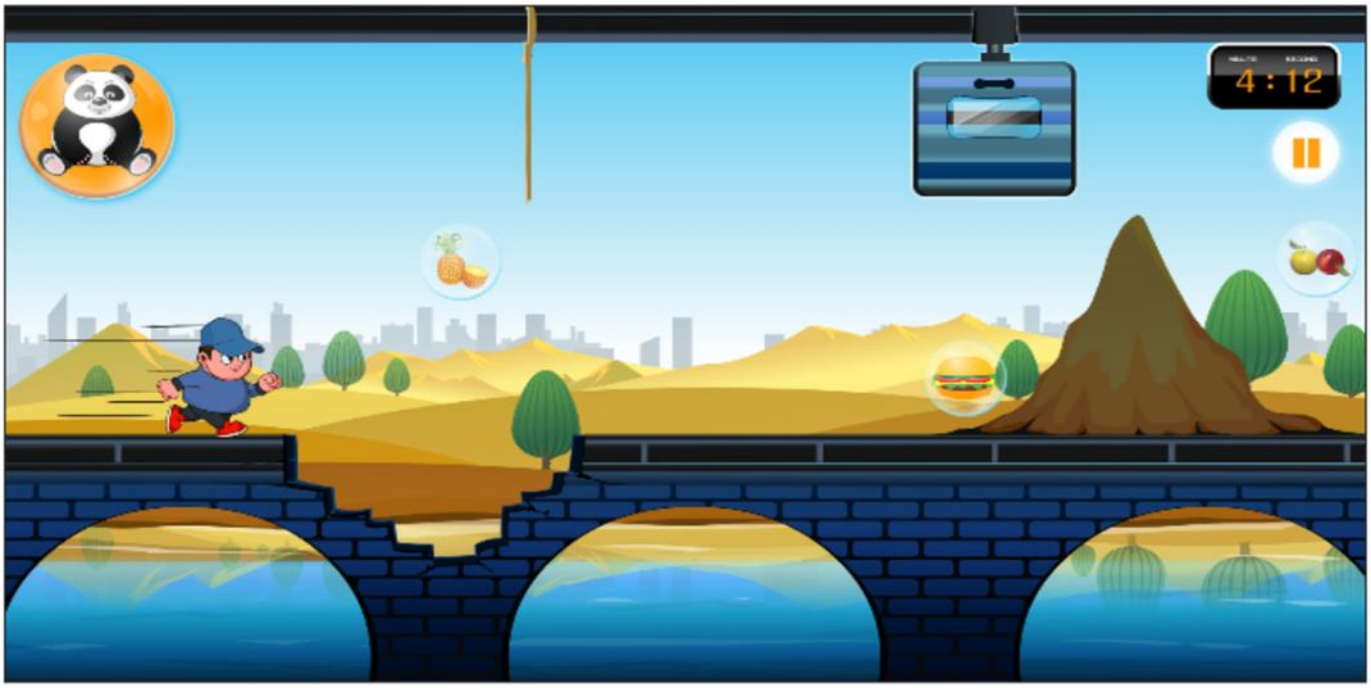
Combating Childhood Obesity with Mobile App

Cardiovascular diseases (CVD) such as heart attacks and strokes are the top causes of death both in Malaysia and worldwide. In fact, more people died from CVD than from all cancers combined. Although important strides have been made in the treatment of CVD, prevention is still the most effective measure. The major risk factors for CVD are age, male gender, high blood pressure, high lipid levels, diabetes, and smoking. Although increased weight is not an independent risk factor for CVD, keeping weight under control is still crucial as obesity increases blood pressure, lipid levels and the risk of diabetes. Conversely, significant weight reduction would be particularly useful in reducing CVD risk as it lowers many other risk factors.

In a 2012 collaborative workshop between University of Malaya and Curtin University, CVD was identified as one of the four major health challenges whereby innovative strategies were required. The researchers realised that childhood obesity was the root cause. Childhood obesity is a critical global health problem, and its prevalence rate is increasing rapidly. One in ten school-aged children are overweight; and of these, a quarter is obese. Recent estimates showed that 22.5% of boys and 19.1% of girls below the age of 20 years in Malaysia are overweight or obese; and these figures are the highest in the Southeast Asian region.

Studies have shown that obese children result in obese adults. A literature review showed that 80% of children who are overweight at the age of 10-15 continued to become obese at 25 years old. Management of childhood obesity are broadly limited by lifestyle behavioural changes. Therefore, the only viable solution to combat childhood obesity is primary prevention for all children.

One of the causes of childhood obesity is living a sedentary lifestyle. The usage of mobile devices including smartphones and tablets only exacerbated the problem. Yet, it will be a challenge or near impossible to reduce the use of mobile devices. As such, the researchers decided to create a mobile app and try to tackle the childhood obesity issue. The proposed app was named StopO first, which was immediately rejected by the children who are the stakeholders. The research was planned in three stages – baseline, development of the app, and testing. Interviews were carried out for children, parents and teachers in a private primary school. The results from the baseline study helped to inform the development of the mobile application. The research was then renamed as "Pupils and Parents Assessment of Nutritional Diets and physical Activity Study (PANDAS)".



The development of the mobile application is a long learning process as the researchers are mainly busy health care providers with no software development experience. The final product of the research has yet to be tested. An e-Health group was established by the Faculty of Medicine to support such endeavours in the future. The e-Health group can serve as a platform for researchers to share experiences with others facing the same dilemma. Mobile applications testing is a crucial component during development phase. Interested parties are welcomed for further collaborations.

ASSOC. PROF. DR. LIEW SU MAY

Department of Primary Care Medicine
Faculty of Medicine
University of Malaya

su_mayliew@um.edu.my

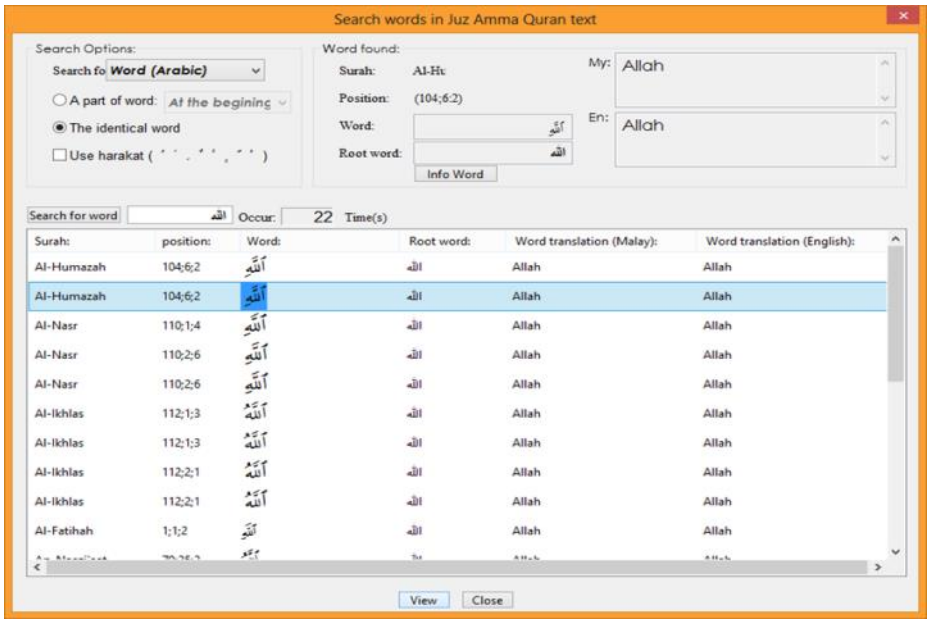
AINUL QURAN™ : Your Arabic Companion

Ainul Quran™, an Arabic Qur'an learning and visualization system to assist non-Arabic speakers in word recognition of the Qur'an, won a silver award in PECIPTA 2017 held in Gong Badak Terengganu on 7-9 October 2017.

The Word Recognition (WR) theory, through Word Frequency Effect (WFE) and Word Superiority Effect (WSE), is used as a basis to achieve Word Recognition and consequently, reading comprehension of the Qur'an. The WSE shows that a letter is easier to be recognized in known words compared to non-words; while the WFE shows that more frequent words are responded to more rapidly.

Figure shows the main interface of the software. The Ainul Quran™ visual system interface is divided into two main parts: the Surah Area on the left side; and the Occurrences Plot Area on the right side. In the surah area, there are word panel, surah name / number, add vocabulary button and surah panel. Meanwhile, the occurrence plot page consists of translation in Malay / English and icons for different use of the software. Users can view vocabulary or vocabulary percentage, search for Arabic, English and Malay words and view all words occurrences. Besides that, users can also view surah by surah and the meaning of ayah, words by words. The Ainul Quran™ also display Malay-Arab words for users. The main search interface is shows how users can view the result of their searches in the search window by clicking the words from the occurrence plot or through the menu.

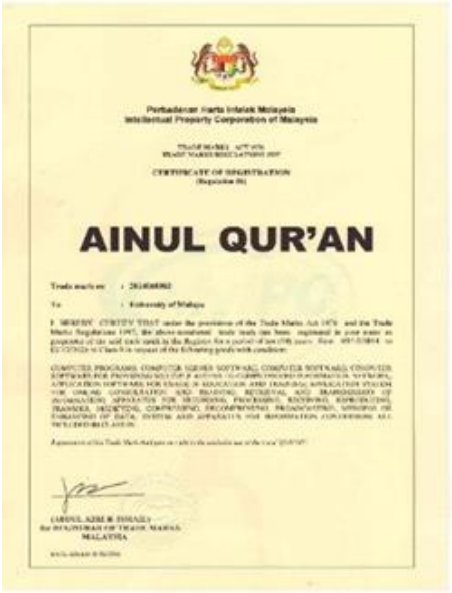
Ainul Quran™ was developed according to the software life cycle process: (1) requirement analysis, (2) design, (3) implementation and (4) testing. It went through three version changes, started with PaCQ interface (2012), Ainul Quran Version 2 (2014) and the latest version 3 (2017). In 2014, a patent had been filed and Ainul Quran™ trademark was officially obtained. Currently, the software has been developed for the 30th part of the Quran. The software will be further enhanced for other languages in future, such as Mandarin, Tamil and Turkish.



The Main Search Interface

The result of an experimental study on 90 participants in Malaysia showed evidence of improvement in word recognition based on scores and time taken to complete the Arabic word recognition tests after using the initial version of Ainul Quran™. This software has undergone usability test for the past few years, with 45 participants in 2010; 15 participants in 2013 and six participants in 2017.

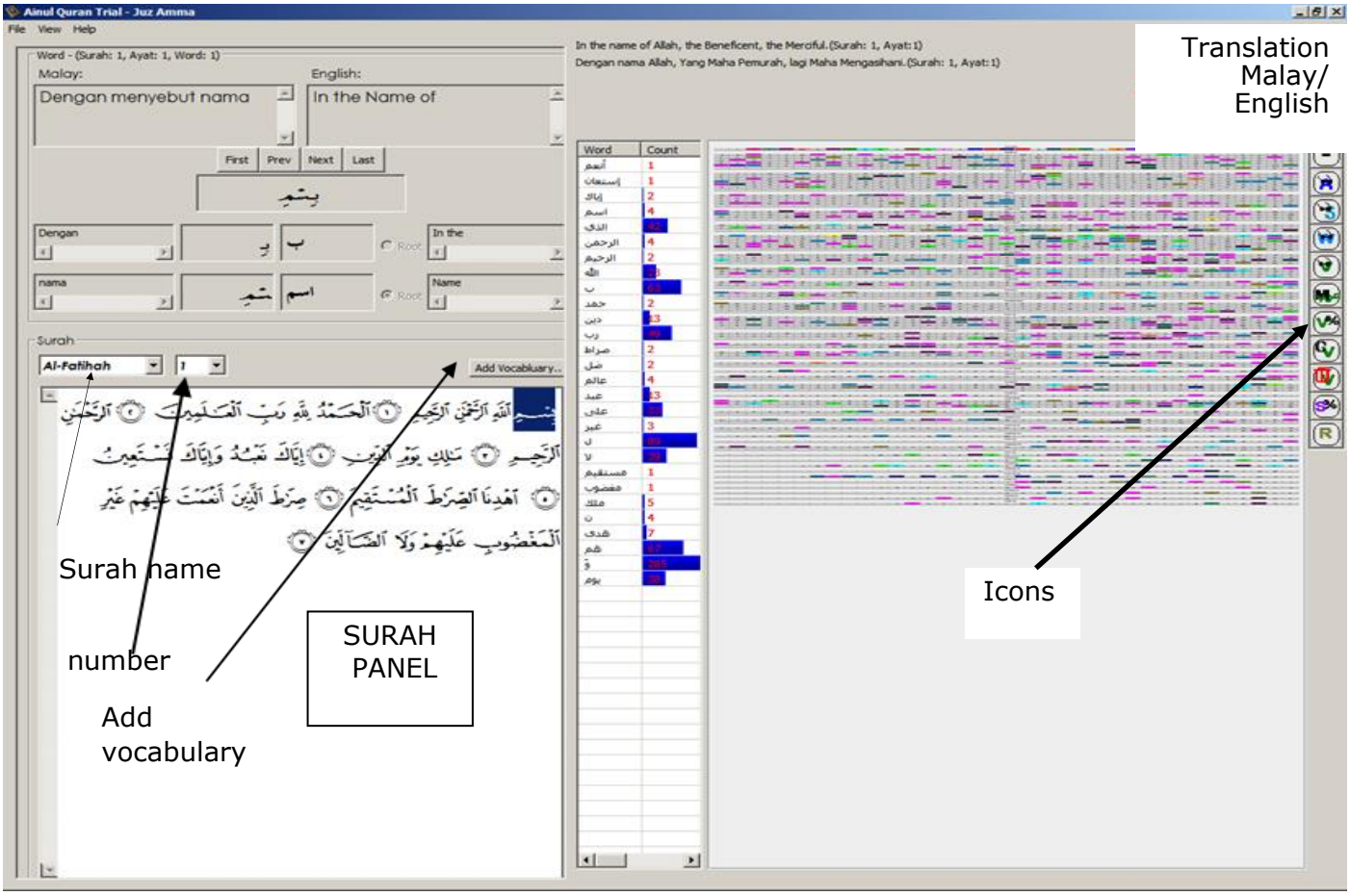
Ainul Quran™ software has been sold for its targeted users in Malaysian market. This software has a potential market for Quranic Arabic students (an estimation of at least 200K students in mosques and *surau* in Malaysia), Tahfiz and Madrasah's students and teachers, and for Indonesian Muslims. Two series of workshop on the software usage tutorial were conducted. In addition, a workshop was also conducted during the International Quranic Conference in Pahang whereby its participants were Tahfiz school teachers. In 2017, the researchers held a public workshop at the Faculty of Computer Science and Information Technology UM.



Ainul Quran's Trademark

SURAH AREA

OCCURRENCE PLOT



The Main Interface of Ainul Quran™

Poster for Ainul Quran™'s workshop

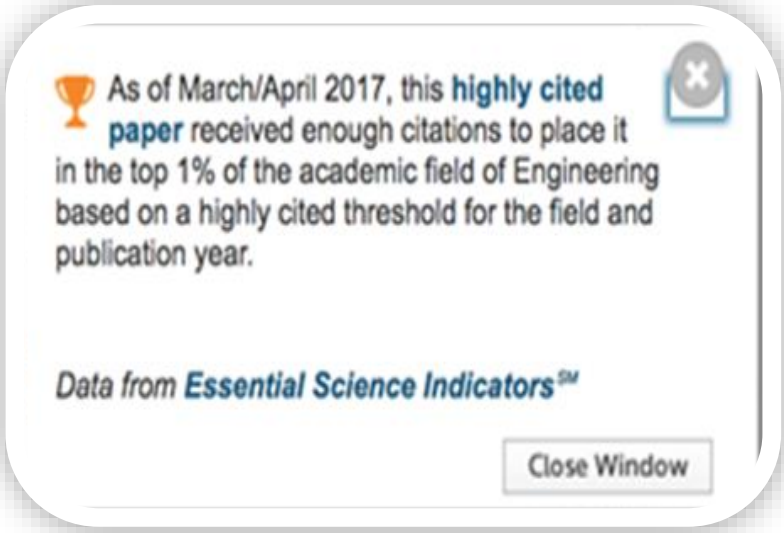
DR. RAJA JAMILAH BINTI RAJA YUSOF

Department of Software Engineering
Faculty of Computer Science & Information Technology
University of Malaya

rjry@um.edu.my

What characterize Malaysian highly cited papers?

The Essential Science Indicators (ESI), a component of the citation database Web of Science™ (WoS) which was designated by Clarivate Analytics, keeps track of papers published in most recent 10 years of publications by citations ranked in the top 1% for their respective publication years in the 22 main subject fields. These are known as "Highly Cited Papers". In June 2014, Thomson Reuters published a list of 3,215 highly cited researchers (http://highlycited.com/) based on the top 1% most highly cited papers per author from 2002 to 2012. Using this highly cited papers as an indicator in research assessment has been an emerging interest ever since.

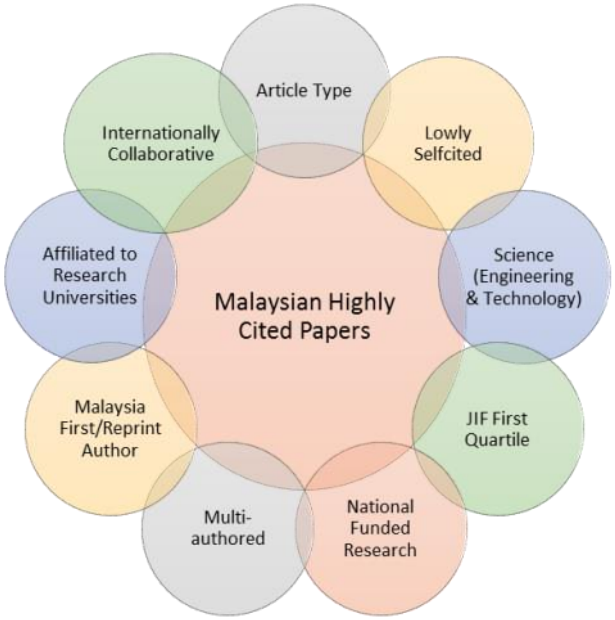


A screenshot showing the trophy which denotes "Highly Cited Papers" in ESI, Web of Science™ (WoS).

Acknowledging highly cited papers is particularly appropriate as it gives even more interpretable results than the analysis of the entire national output. Malaysia's progress can be seen in the outstanding increase of scientific publications output between 2006 and 2016 as well as the production of highly-cited papers. These are the papers that have enough citations to be placed in the top 1% of a particular academic field based on a highly cited threshold for the field and publication year, and can be used to benchmark research performance against field baselines worldwide.

Studies characterizing highly cited papers have become quite widespread in many disciplines. The need for highly cited papers is arising too as countries, funding agencies and universities are trying to gauge research performance and identify top researchers and their research impacts. This study aims to investigate the characteristics of the Malaysian highly cited papers. Literature has shown that highly cited papers are the results of international collaboration and multi-authorship. However, the researchers wonder if they hold true for Malaysian highly cited papers, and to what extent do Malaysian authors dominate or are dominated in such a collaborative and multi-authorship works. Identification of these characteristics may play a key role in gauging the possibility of a paper to be highly cited.

The bibliometric approach was commonly used to explore the characteristics of highly cited papers. The term "Malaysia" was used as a keyword for address search and the search was refined using "highly cited papers" in ESI. Data for highly cited articles were identified from 2006 – 2016 since ESI uses a 10-year interval to calculate the highly cited papers. All three types of scientific papers (article, review and proceeding) were included for the 22 subject areas. As a result, 708 papers comprising of 443 articles, 258 reviews and 7 proceedings, along with the total citation count of 70660, was extracted from WoS into a Comma-separated values (CSV) file.



Nine characteristics of Malaysian highly cited papers

As a small scientific nation, Malaysia has a rather limited number of papers being highly cited. The researchers observed nine bibliometrics characteristics for highly cited papers based on the 708 datasets.

Characteristics	Details
Article Type	Malaysian highly cited papers are mainly represented by articles (62.6%). However, review papers have more impact (125 citations per paper [CPP]) compared to articles (87 CPP).
Low Self-citation	They are very lowly self-cited (0.9% with self-citations). In the case of highly cited papers, the share of self-citations is very low because (i) high citation counts cannot be easily obtained from self-citations; and (ii) self-citation rates are taken into consideration as journal evaluation process of WoS Core Collection citation indices.
Science-based (Engineering & Technology)	They are predominantly from the sciences (98.7%). Engineering & Technology has the highest contribution to Malaysian highly-cited papers (52.0%), followed by Science (30.5%) and Medical & Health Sciences (16.2%).
JIF First Quartile	They are mainly published in the First Quartile of the Journal Citation Report (JCR) (79.0%). In contrast, less than 1 percent appears in the category of journals cited below average (Quartile 4).
National Funded Research	They are outcomes of funded research (61.4%), with 35 percent acknowledging more than single funder, and 26.4 percent acknowledging a single funder. However, 38.6 percent did not acknowledge any funding support. It is interesting to note that the papers acknowledging funding support (62.4%) are outcomes of national funded research. A total of 164 papers acknowledged both the Ministry of Higher Education (MOHE) (UM) as the funding agencies, with 89 papers are outcomes of the High Impact Research (HIR) funded by MOHE and UM.
Multi-authored	They are typically authored by many (97.6%), with an average of 10.8 authors per paper. A total of 15.8 percent are Malaysian-based authors and 83.7 percent are international authors. Three authored papers were the dominant authorship pattern (18.6%), followed by multiple authorship (11 to 999 authors, 17.1%). Mega authorship (more than 1000 authors) is evident in 45 papers, and all 45 papers have more than 2000 authors.
Malaysia as First / Reprint Author	There is a good number of Malaysian as reprint authors (62.1%) and first authors (63.8%). It is safe to conclude that Malaysians authors, to a large extent, are major contributors to highly cited papers. In the context of Malaysia, reprint (or corresponding author) denotes seniority and leadership in the research work, and is used as an indicator in research performance assessment.
Affiliated to Research Universities	Highly cited papers affiliated to Malaysian institutions are mainly from research universities (68.5%), mainly from the University of Malaya, followed by Universiti Sains Malaysia and Universiti Putra Malaysia.
International Collaboration	Malaysian highly cited papers, of which Malaysian authors play a major contribution (as first or reprint authors) are more internationally collaborative, with 72.3 percent are results from a single country collaboration. The highest collaboration is with Iran, followed by Australia and the UK. A total of 53.7 percent of highly cited collaborative papers are with 12 Asian countries (Iran, India, Indonesia, Saudi Arabia, Pakistan, Japan, Singapore, South Korea, Turkey, Egypt, Iraq and Bangladesh). Malaysia has only two highly cited papers with China, and one each with France and Russia.

To conclude, it is believed that highly cited papers accurately measure scientific quality, and the highly cited papers have important contributions to a nation in particular fields. While a few of the nine characteristics mirror those of other studies, they do differ in other ways. To a significant extent, Malaysian authors dominate in collaborative and multi-authorship works specially with their Asian counterparts, revealing findings which indicate well-grounded predictions to become highly cited.

PROF. DR. ABRIZAH ABDULLAH
DR. NOORHIDAWATI ABDULLAH
DR. YANTI IDAYA ASPURA MOHD KHALID

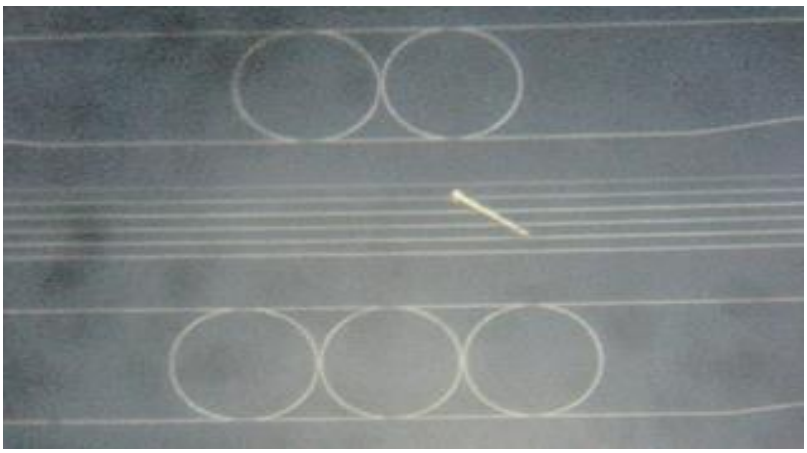
Department of Library & Information Science
Faculty of Computer Science & Information Technology
University of Malaya

abrizah@um.edu.my
noorhidawati@um.edu.my
yanti@um.edu.my

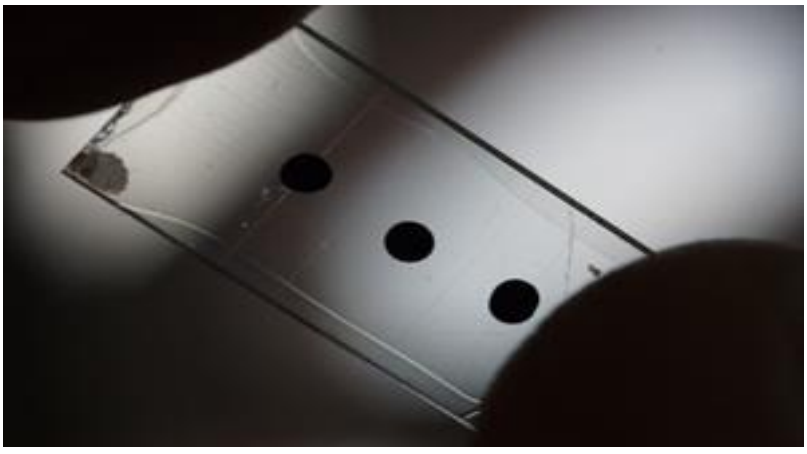
A detailed finding of the work is published in Noorhidawati, A., Yanti Idaya A.M.K. & Abrizah, A. 2017. The characteristics of Malaysian highly cited papers. *Malaysian Journal of Library & Information Science*, **22** (2): 85-99.

Planar Lightwave Circuits -From optical fibre transmission to on-chip optical signal processing

The photonics technology evolves with the advancement of electronics industry. Electronics devices use electrons as signal carrier, whereas photons (packets of light particles) criss-crosses photonics devices to commute information at the speed of light. Electronics evolution started much earlier, producing single discreet electronic devices such as diodes, capacitors and transistors. These devices are later integrated onto a single platform (in the form of a silicon chip) to perform more complex functions while occupying a smaller footprint. Today, the top range microprocessors produced by Intel and AMD consist of more than 4 billion transistors on a single chip which is less than a square centimetre in size.



Integrated microring resonator arrays on HIC silica platform



Graphene oxide coated optical circuits for light polarising functions

Photonics technology has achieved a far more matured development of discreet, single functional devices, which enables our high speed broadband internet that connects the world today. Fibre-to-the-Home technology (or better known as TM UniFi in Malaysia) is impossible without the development of photonics integrated circuits consisting about 30 devices per square centimetre. The infinitesimal device count compared to its electronics counterpart promises a vast research and development opportunity for photonics integrated circuits towards the ultimate goal of all-optical signal processing.

Why go optical?

The reason is to develop a more energy efficient signal processor that will not be affected by electromagnetic interference. Though the coaxial cable equivalent is optical fibre, planar lightwave circuit (PLC), on the other hand, is an integrated circuit analogy. University of Malaya owns the high index contrast silica-based PLC fabrication technology. The advantages of silica-based PLC include its low optical loss and compatibility with optical fibre interconnects, enabling seamless inclusion of silica-based PLC devices into existing optical fibre systems. Passive devices such as 1xN power and frequency splitters / combiners (technologies adopted in the TM UniFi and equivalent networks) have been successfully developed. Since silica is a passive material, functionalisation of the silica-based PLC using active materials is necessary to expand its application. One of such functional materials is graphene oxide. High performance waveguide polariser has been demonstrated due to its unique physical and optical characteristics, followed by the demonstration of humidity sensor and all optical-switch based on photo-thermo-optic effect.

The response time of ~100 μs for a thermos-optic switch is not entirely impressive; and silica-based PLCs may not be the ultimate platform for high level photonics integration. Nevertheless, the current works do serve as the foundation for the development of high speed optical switches and modulators, paving the way for integrated optical logic gates, and ultimately high level optical signal processing.

DR. CHONG WU YI

Photonics Research Centre
University of Malaya

wuyi@um.edu.my

Journey to the MS ISO/IEC 17025:2005 Accreditation

Few years back, several testing laboratories in University of Malaya (UM) have requested for funding from UM's top management independently to pursue for the MS ISO/IEC 17025:2005 accreditation. A laboratory with MS ISO/IEC 17025:2005 accreditation meets both technical competence and management system requirements. These requirements are necessary for the laboratory to consistently deliver technically valid test results and calibrations.

Prof. Dr. Awg Bulgiba Awg Mahmud, the then Deputy Vice-Chancellor of Research and Innovation, proposed to have all interested testing laboratories to apply for the accreditation under one certification. This initiative ensured a well-coordinated accreditation process for several laboratories at a much lower cost. A total of fifteen (15) laboratories showed interest to participate as part of the accreditation team.

The initial accreditation taskforce was led by Prof. Dr. Noor Hayaty Abu Kasim, the Dean of Wellness Research Cluster, in late 2013. Prof. Noor Hayaty initiated a discussion with SIRIM STS Sdn. Bhd. for a consultation package to guide UM in obtaining the accreditation. In 2014, the then Director of Center for Research Services (PPP), Prof. Dr. Thong Kwai Ling, took over the taskforce to monitor and coordinate the process of the accreditation exercises. The accreditation team was first led by Ms. Wan Nazatul Naziah Wan Nawi, the Quality Manager, for the preparation of the management and technical documents. The Quality Manager baton was passed to Dr. Hj Azizuddin Hj Kammaruddin in late 2014 for several months before taken over by Madam Aliaa Diyana Azizuddin. The team went through rigorous trainings and audits with SIRIM STS Sdn. Bhd. and visited other accredited laboratories for references. The accreditation exercises were very strenuous and by 2016, only nine (9) laboratories persevered in the pursuit of the accreditation.

The accreditation team, now led by Dr. Hong Sok Lai, went for a Pre-Assessment Audit by Standard Malaysia from 17th to 21st October 2016, and all non-conforming issues were addressed in March 2017. The team then braved through the Compliance Audit which was conducted from 16th to 19th June 2017. The team obtained only one minor non-conforming issue which was addressed in early July 2017. The Standard Malaysia's panel met on 19th July 2017 and agreed to award the MS ISO/IEC 17025:2005 accreditation to all 9 laboratories.

The accreditation team is accredited for 4 fields of testing (mechanical, biological, nucleic acid and electrical) and 1 field of calibration (optical). This accreditation is valid for three years starting from 19th July 2017. During the said period, Standard Malaysia will conduct annual surveillance audit to ensure that the technical competence and management system requirements are maintained.


S/N: 8495

STANDARDS MALAYSIA

Certificate of Accreditation

No: SAMM 837 Accredited since: 19 July 2017

This is to certify that

CENTRE FOR RESEARCH SERVICES
UNIVERSITY OF MALAYA
KUALA LUMPUR
MALAYSIA

has been granted accreditation in respect of the scope of accreditation described in the schedule, subject to the terms and conditions governing the *Skim Akreditasi Makmal Malaysia* (SAMM), the Laboratory Accreditation Scheme of Malaysia.

Laboratories accredited under SAMM meet the requirements of MS ISO/IEC 17025. This Malaysian Standard is identical with ISO/IEC 17025 published by the International Organization for Standardization (ISO).

(DATUK FADILAH BAHARIN)
Director General
Department of Standards Malaysia

Date of issue: 19 July 2017

Issuance of this Certificate is governed by Section 16 Subsections (2) and (3) of Standards of Malaysia Act, 1996 (Act 549)

MS ISO/IEC 17025:2005 Certificate of Accreditation awarded by Standards Malaysia (No: SAMM 837)

DR. HONG SOK LAI

Centre for Research Services
University of Malaya

soklai@um.edu.my

MS ISO/IEC 17025:2005 Accredited Laboratories

Field of Testing: Mechanical

Biomaterial Research Laboratory, Faculty Of Dentistry

https://drmc.um.edu.my/research-laboratory/bmrl/

Spectroscopy Hall, NANOCAT

http://nanocat.um.edu.my/spectroscopic-hall.html

INFRA Analysis Laboratory, Institute of Research Management & Services

https://www.um.edu.my/research-and-community/information-for-researchers/facilities-services/central-laboratory-facilities

Field of Testing: Biological

Proteomics Facility, Medical Biotechnology Laboratory

http://medicine.um.edu.my/departments/lab-units/medical-bio-technology-laboratory/staff/

Orthopedics Molecular and Biological Laboratory, NOCERAL

http://noceral.um.edu.my/laboratories/

Surveillance Laboratory, TIDREC

http://www.tidrec.com/

Algae Research Laboratory, IOES

https://ioes.um.edu.my/

Field of Testing: Nuclei Acid

Surveillance Laboratory, TIDREC

http://www.tidrec.com/

Field of Testing: Electrical

PV Solar Energy Inverter Testing Laboratory, UMPEDAC

http://www.umpedac.um.edu.my/

Field of Calibration: Optical

Optical Calibration Facilities, Photonics Research Centre

http://prc.um.edu.my/

IPPP Central Laboratory Facilities

FACILITIES	MODEL	TEST/SERVICES
Nuclear Magnetic Resonance (NMR 270 MHz)	JEOL 270 MHz	^{1}H, ^{13}C & others
Nuclear Magnetic Resonance (NMR 600 MHz)	Bruker AVANCE III 600 MHz	^{1}H, ^{13}C & 2D analysis
Sample Preparation (SEM)	Polaron CPD 7501 Critical Point Dryer Biorad Sputter Coater	Carbon/Gold Coating; Chemical Treatment /CPD
GCMS	7890A GC/ MS Agilent 5975 Shimadzu QP2010 ULTRA GCMS	Compositional Test (Scan & SIM Mode using RTX-5 Column); Compositional Test (Own Column)
Confocal Laser Microscope	Leica Tcs Sp5 Ii	Fluorescent Imaging; Life cell imaging (Time Lapse)
Field Emission Scanning Electron Microscope (FESEM-EDX)	Quanta FEG 450 EDX-OXFORD	Imaging; Compositional
Surface Area Analyzer (BET)	Micromeritics ASAP2020 TRISTAR II 3020 Kr	Surface Area; Pore Volume; Pore Size Distribution
Differential Scanning Calorimeter (DSC)	Perkin Elmer (DSC-8000)	Heat Flow Analysis; Specific Heat Capacity (Cp)
Simultaneous Thermal Analyzer (STA)	Perkin Elmer (STA-6000)	Weight Loss; Melting Curves
Dynamic Mechanical Analyzer	Perkin Elmer	Creep Test
Particle Image Velocimetry (PIV)	Dantec Dynamics Nano L135-15piv	2D & 3D Imaging
DNA Sequencer	Applied Biosystems (3730xl DNA Analyzer)	DNA Sequencing
Real Time PCR	Applied Biosystems Quantstudio (12k Flex Real Time PCR System)	Quantitative PCR Application
LCMS	Agilent Technologies	Qualitative
UHPLC	Agilent Technologies	Qualitative
Ellipsometer	J.A. Woollam M-2000	Change in Polarization; Optical Constant; Film Thickness
Rheometer	TA Instruments DHR-2	Viscosity; Viscoelastic
Tensiometer	Attension Sigma 700	Surface and Interfacial Tension; Powder Wettability

Address :	**INFRA Analysis Laboratory** **Level 3, Research Management & Innovation Complex** **University of Malaya** **50603 Kuala Lumpur**
Email :	**lab_infra@um.edu.my**
Tel :	**+603-7967 4619** **+603-7967 7022 Ext: 2320**
Fax :	**+603-7967 4644**

INSTITUTE OF RESEARCH MANAGEMENT & SERVICES
Research Management & Innovation Complex
University of Malaya
50603 Kuala Lumpur
Malaysia

Tel: (+603) 7967 4643/4525/4698/4697
Fax: (+603) 7967 4699
http://umresearch.um.edu.my

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